Mars Surveyor 98 Project

Mars Polar Lander
Raw and Reduced Science Archive
Volume Organization
Software Interface Specification

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DRAFT

Concurrence on Version 1.0 of MPL Raw and Reduced Sci. Arch. Volume Organization SIS

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ACRONYMS AND ABBREVIATIONS

ASCII	American Standard Code for Information Interchange
CCD	Charge-Coupled Device
CD-ROM	Compact Disc - Read Only Memory
CD-WO	Compact Disc - Write Once
CODMAC	Committee On Data Management And Computation
CR	Carriage Return
DN	Data Number or Digital Number
DOS	Disc Operating System
DPW	Data Preparation Workbook
EDR	Experiment Data Record
ETS	Elbow Temperature Sensor
GIF	Graphics Interchange Format
HFS	Hierarchical File System
HTML	HyperText Markup Language
IBM	International Business Machines®
ISO	International Standards Organization
JPEG	Joint Photographic Experts Group
JPL	Jet Propulsion Laboratory
LF	Line Feed
LIDAR	Light Detection and Ranging
M98	Mars Surveyor 98
MARDI	Mars Descent Imager
Mbytes	Megabytes
MCO	Mars Climate Orbiter
MET	Meteorology Package
MIPL	Multimission Image Processing Laboratory
MIPS	Multimission Image Processing Subsystem
MPL	Mars Polar Lander
MSP	Mars Surveyor Program
MVACS	Mars Volatiles and Climate Surveyor
NAIF	Navigation and Ancillary Information Facility
NASA	National Aeronautics and Space Administration
NSSDC	National Space Science Data Center
PC	Personal Computer
PDF	Adobe® Portable Document Format
PDS	Planetary Data System
PDS-CN	PDS Central Node
PSDD	Planetary Science Data Dictionary
RA	Robotic ARM
RAC	Robotic Arm Camera
SCLK	Spacecraft Clock Count (usually implies *start* count)
SIS	Software Interface Specification
SSI	Surface Stereo Imager
STP	Soil Temperature Probe
TBD	To Be Determined
TEGA	Thermal and Evolved Gas Analyzer
TIFF	Tag Image File Format
VICAR	Video Image Communication and Retrieval system
VMS	Virtual Memory System
XAR	Extended Attribute Record

ACTION ITEMS FOR CLOSURE

Item	Sec.	Assignee	Closure Date
Get project document number, if applicable	front, head	E. Duxbury	
Update relevant documents list	1.3	E. Duxbury	
Check estimated number of volumes	2.2	E. Duxbury	
Determine what calibration data will be included on CD	3.2.2.2	MVACS Team	
Determine what additional documents will be included on the CD.	3.2.2.4	MVACS Team	
Determine what display software can/should be included on the CD.	3.2.2.7	E. Duxbury, S. Hughes, D. Jensen	
Update tables for RAC, rather than SSI.	3.2.2.8 A & B	E. Duxbury	

1.0   INTRODUCTION

1.1   Content Overview

This Software Interface Specification (SIS) describes the form and content of the Mars Surveyor 98 Mars Polar Lander Science Archive Volume. This is an integrated volume containing raw and reduced data products from all the instruments on board the spacecraft. Higher level products will be archived separately.

PDS formatted data products and associated ancillary files will be produced by each of the instrument teams with the assistance of their respective PDS Nodes. The volume will be assembled and produced by the MVACS archiving team. The completed archive volumes will be delivered to the project science team members and to the Planetary Data System (PDS).

Each data file will be accompanied by an associated PDS label, either in attached or detached form. Documentation files shall be provided which inform the user about the organization and content of each disc, the definition of the labels, and the index files containing information about all the data files stored in the various data sets.

All PDS label formats and documentation are based on the Planetary Data System Data Preparation Workbook (reference 1).

All data formats are based on the Planetary Science Data Dictionary Document (PSDD) (reference 3).

1.2   Scope

The specifications in this document apply to the Experiment Data Records, and where applicable, the Reduced Data Records, produced by the LIDAR, MARDI, MET, Microphone, RA, RAC, SSI, and TEGA instruments on board the Mars Polar Lander spacecraft.

1.3   Applicable Documents

Applicable documents used in producing this specification include:

1) Planetary Data System Data Preparation Workbook, JPL D-7669, Part 1.
2) Planetary Data System Standards Reference, JPL D-7669, Part 2.
3) Planetary Science Data Dictionary Document, JPL D-7116.
4) Information Processing - Volume and File Structure of CD-ROM for Information Interchange, ISO 9660-1988.
5) Mars Volatiles and Climate Surveyor Experiment Data Record, JPL D-?.
6) (RAC/SSI RDR data product SIS)
7) (RA data product SIS)
8) (TEGA data product SIS)
9) (MET data product SIS)
10) (MIC data product SIS)
11) (LIDAR data product SIS)
12) (MARDI data product SIS)
13) MSP 98 (Mars Climate Orbiter and Polar Lander): Archive Generation, Validation, and Transfer Plan, ?
14) Mars Surveyor Program Data Management Plan, ???

2.0   INTERFACE CHARACTERISTICS

2.1   Operations Perspective

2.1.1   Data Source, Destinations, and Transfer Method

The MPL Science Archive volume is an integrated collection of data from numerous instrument teams. The MVACS archiving team will coordinate the overall collection of data and assemblage of it into a unified CD structure. The following table shows who will be responsible for each component of the archive, and the PDS Node responsible for assisting them.

Instrument	Data Provider	PDS Node
Light Detection and Ranging	IKI/RSA	Atmospheres
Mars Descent Imager	MSSS	Imaging/Flagstaff
Meteorology Package	MVACS	Atmospheres
Mars Microphone	Planetary Society	Atmospheres
Robotic Arm	MVACS	Geosciences
Robotic Arm Camera	MVACS & JPL/MIPS	Imaging/JPL
Surface Stereo Imager	MVACS & JPL/MIPS	Imaging/JPL
Thermal and Evolved Gas Analyzer	MVACS	Geosciences
SPICE[1]	NAIF	NAIF

After the archive volumes have been validated and peer reviewed, the MVACS archiving team will deliver pre-mastered CD-WOs to the PDS Central Node for mastering and distribution. Copies of the CDs will be archived with all participating nodes of the PDS and with the National Space Science Data Center.

2.1.2   Generation Method and Frequency

The detailed specifications and processing histories for each data product type are provided in references 5? through 12?, in section 1.3 above. Copies of these documents will be included on the archive volumes. The individual products will be produced using a variety of processes and software programs dependent on the team producing each data set. The data products will then be delivered to the MVACS archiving team, who will assemble and pre-master the archive on CD-WO. After the archive volumes have been peer reviewed and corrected, they will be mass produced on CD-ROM.

The CD-ROMs shall be produced as rapidly as possible on a best efforts basis. It is intended that the volumes should be ready for mastering and mass production by October 1, 2000.

2.2   Volume and Size

Each CD-ROM shall contain at most 650 Mbytes of data. Within this limitation, as many sols (Martian days) of data as can fit on a CD-ROM will be included. This is expected to result in the publication of an approximately sixteen volume set.

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[1] Note: The complete set of SPICE files for the Mars Surveyor 98 project will be archived on a separate volume. However, some individual files may be included on this volume for the sake of convenience.

2.3   Interface Medium Characteristics

The M98 Archive volume CD-ROM physical characteristics shall conform to ISO-9660 level 2 industry standards (reference 4).

Note: throughout this document, the assumption has been made that the data will be archived on CD-ROM. If, at some point in the future it should be decided to archive on DVD-ROM, there will be very little impact on the format of the archive volume, with the obvious exception that a greater volume of data will be stored on each physical volume. The resulting number of published volumes would therefore be smaller (approximately three DVDs instead of 16 CDs). The physical media characteristics in that case would conform to the relevant UDF standard rather than the ISO 9660 standard for CD-ROMs.

2.4   Backup and Duplicate Copies

The CD-ROM contents shall be stored on magnetic disc or write once physical media until validated masters have been produced.

3.0   CD-ROM FORMAT AND CONTENT

This section describes in detail the format and content of the science archive.

3.1   Format

All MPL raw and reduced science data products shall be formatted in accordance with Planetary Data System specifications (references 1-3). These specifications are summarized below.

3.1.1   Disc Format

The archive volume CD-ROM format shall be compatible with various computer systems including IBM PC, Apple Macintosh, Sun, and Digital VAX. However, the data files will not contain extended attribute records, so users of older VMS systems may have difficulty reading them. The CD-ROM format shall be in accordance with the ISO-9660 level 2 Interchange Standard (reference 4).

3.1.2   File Formats

The following paragraphs describe file formats for the various kinds of files contained on the CD-ROMs.

3.1.2.1   Text Files

Text files (.TXT suffix) may exist in any directory, including the root directory. They are ASCII files with attached PDS labels, and provide information about the data on the CD (as in the AAREADME.TXT file) or about data in a specific directory. All text files are streams of bytes with both a carriage return character (ASCII 13) and a line feed character (ASCII 10) as the line terminator. This allows the files to be read by the HFS, DOS, UNIX, and VMS operating systems.

The following is a sample PDS label for an AAREADME.TXT file.

```
PDS_VERSION_ID          = PDS3
RECORD_TYPE             = STREAM

OBJECT                  = TEXT
  PUBLICATION_DATE      = 2000-10-01
  INTERCHANGE_FORMAT    = ASCII
  NOTE                  = "This file describes the format and content of
                           this CD-ROM."
END_OBJECT              = TEXT
END
```

3.1.2.2   Document Files

Document files exist in the document directory, and include textual material describing the mission, spacecraft, instruments, data sets, and calibration. Additional document files may be found in the extras directory of the CD. Possible formats for these documents include Adobe Portable Document Format (".PDF"), HyperText Markup Language (".HTM"), and plain ASCII (".ASC"). At least one copy of each document file must be in either plain ASCII or HTML. Illustrations and images for these documents are stored in separate GIF, TIFF, or JPEG formatted files, which are also considered to be document files. (Note: the PNG image format is currently being studied by the PDS as an alternative to GIF, and may be considered for inclusion in this archive.)

All ASCII and HTML files are streams of bytes with both a carriage return character (ASCII 13) and a line feed character (ASCII 10) as the line terminator. The ASCII files can be read on any operating system. The HTML files can be read with most World Wide Web browsers that are capable of displaying tables. The PDF documents are a binary format that can be read with the Adobe Acrobat Reader, available from "http://www.adobe.com". GIF, TIFF, and JPEG images can be displayed using many commonly available image display programs.

All document files are described by detached PDS labels. The PDS label file has the same name as the document file(s) it describes, with the extension ".LBL", unless the single label describes multiple files that make up the same document, (ex., "CALIB001.GIF", "CALIB002.GIF", "CALIB003.GIF"). In this case, the label file has a similar name to the document, ex. "CALIB.LBL". The following is a sample detached PDS label file, entitled "VOLSIS.LBL", describing this document, found in the "VOLSIS.HTM" and "VOLSIS.PDF" files.

```
PDS_VERSION_ID          = PDS3
RECORD_TYPE             = STREAM
^HTML_DOCUMENT          = "VOLSIS.HTM"
^PDF_DOCUMENT           = "VOLSIS.PDF"

OBJECT                  = HTML_DOCUMENT
  DOCUMENT_NAME         = "Mars Polar Lander Raw and Reduced Science
                           Archive Volume Organization Software
                           Interface Specification"
  DOCUMENT_TOPIC_TYPE   = VOLUME_SIS
  INTERCHANGE_FORMAT    = ASCII
  DOCUMENT_FORMAT       = HTML
  PUBLICATION_DATE      = 1999-11-01
END_OBJECT              = HTML_DOCUMENT

OBJECT                  = PDF_DOCUMENT
DOCUMENT_NAME           = "Mars Polar Lander Raw and Reduced Science
                           Archive Volume Organization Software
                           Interface Specification"
  INTERCHANGE_FORMAT    = BINARY
  DOCUMENT_FORMAT       = "ADOBE PDF"
  PUBLICATION_DATE      = 1999-11-01
END_OBJECT              = PDF_DOCUMENT
END
```

3.1.2.3   Catalog Files

Catalog files (".CAT" suffix) exist in the catalog directory, with the exception of the VOLDESC.CAT file which is located in the root directory. These are ASCII files formatted as PDS catalog objects (see reference 2). All catalog files are streams of bytes with both a carriage return character and a line feed character as the line terminator. This allows the files to be read by the HFS, DOS, UNIX, and VMS operating systems.

Copies of some catalog files are also included in HTML format. These files are indicated with the suffix ".HTM" and are kept in the document, rather than the catalog, directory.

3.1.2.4   Tabular Files

Tabular files (.TAB suffix) are ASCII files formatted for direct reading into many database management systems on various computers. All fields are separated by commas, and character fields are enclosed in double quotation marks ("). (Character fields are padded with spaces to keep quotation marks in the same columns.) Character fields are left justified, and numeric fields are right justified. The "START_BYTE" and "BYTES" values listed in the labels do not include the commas between fields or the quotation marks surrounding character fields. The records are of

fixed length, and the last two bytes of each record contain the ASCII carriage return and line feed characters. This allows a table to be treated as a fixed length record file on computers that support this file type and as a normal text file on other computers.

All tabular files are described by detached PDS labels. The PDS label file has the same name as the data file it describes, with the extension .LBL; for example, the file INDEX.TAB is accompanied by the detached label file INDEX.LBL in the same directory.

3.1.2.5 PDS Label Files

PDS label files (.LBL suffix) are located in many directories. They are descriptive labels (see reference 4) and may be either attached to or detached from their associated files.

The PDS label file is an object-oriented file; the object to which the label refers (e.g. IMAGE, TABLE, etc.) is denoted by a statement of the form:

```
^object = location
```

in which the carat character (^, also called a pointer in this context) indicates that the object starts at the given location. The location denotes the name of the file containing the object, if the label is detached, or the starting record or byte number, if the label is attached. For example:

```
^INDEX_TABLE = "INDEX.TAB"
```

indicates that the INDEX_TABLE object described by the INDEX.LBL file is in the file named "INDEX.TAB".

```
^IMAGE = 3
```

indicates that the IMAGE object begins at record 3 of the same file that the label is attached to. Below is a list of the possible formats for the ^object definition.

```
^object      = n
^object      = n <BYTES>
^object      = ("filename.ext")
^object      = ("filename.ext", n)
^object      = ("filename.ext", n <BYTES>)
^object      = ("dirlist/filename.ext", n <BYTES>)
```
where

n	is the starting record or byte number of the object, counting from the beginning of the file (unless specified as bytes, this is assumed to be records),
<BYTES>	indicates that the number given is in units of bytes,
filename	is the upper-case file name,
ext	is the upper-case file extension,
dirlist	is a UNIX style, forward slash-delimited path-list of parent directories, in upper case, that specifies the object file directory (used only when the object is not in the same directory as the label file). The list begins at directory level below the root directory of the CD-ROM. 'dirlist/' may be omitted when the object being described is located either in the same directory as the detached label, or in a subdirectory named 'label' that is located in a higher level of the directory tree, typically the CD-ROM root itself.

The internal format of the data object is then described within the PDS label in an area constructed as follows:

```
OBJECT          = object
  KEYWORD1       = value1
  KEYWORD2       = value2
  .
  .
  .
  KEYWORDn       = valuen
END_OBJECT      =
```

Brief descriptions of the IMAGE, TABLE, and COLUMN objects are given here as these objects are commonly used on this CD volume. (The INDEX_TABLE object is a sub-type of the TABLE object and is constructed similarly.) Complete details and descriptions of other data objects are available in the PDS Standards Reference (ref. 2).

The following is an example of a typical IMAGE object for a data file on this CD volume:

```
OBJECT                        = IMAGE
  INTERCHANGE_FORMAT          = BINARY
  LINES                       = 248
  LINE_SAMPLES                = 256
  BANDS                       = 1
  SAMPLE_TYPE                 = MSB_UNSIGNED_INTEGER
  SAMPLE_BITS                 = 16
  SAMPLE_BIT_MASK             = 2#0000111111111111#
  MAXIMUM                     = 3296
  MEAN                        = 570.6900
  MEDIAN                      = 512
  MINIMUM                     = 77
  STANDARD_DEVIATION          = 356.8550
  FIRST_LINE                  = 3
  FIRST_LINE_SAMPLE           = 1
  CHECKSUM                    = 8204396
END_OBJECT                    = IMAGE
```

The image data, as pointed to by the ^IMAGE pointer, are completely described by this object. The INTERCHANGE_FORMAT keyword indicates that the data described by this object is in a binary form. The LINES and LINE_SAMPLES keywords give the number of pixels (picture elements) in the vertical and horizontal directions, respectively. The SAMPLE_BITS keyword provides the number of bits per pixel. The SAMPLE_BIT_MASK keyword shows which of the bits in a pixel are actively used. (Thus, the above data is actually 12-bit data, even though the pixels are stored as 2-byte values.) The BANDS keyword provides the number of planes of data. The rest of the keywords provide statistical information about the image data, or indicate its offset within the CCD frame.
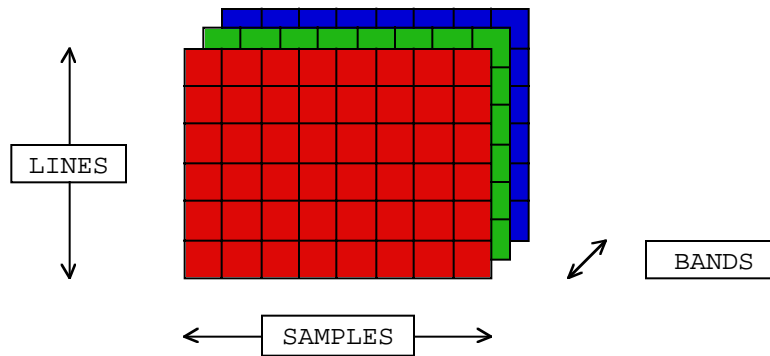
The second example of an object is somewhat more complex, since it involves one object stored within another. The following objects describe the structure of a simple table with 3 columns and 4 rows.

	Column 1								Column 2				Column 3						
"	L	E	M	O	N		"	,	1	1	9	,	Y	E	L	L	O	W	\<CR>	\<LF>
"	A	P	P	L	E		"	,		8	7	,	R	E	D				\<CR>	\<LF>
"	G	R	A	P	E		"	,			2	,	G	R	E	E	N		\<CR>	\<LF>
"	O	R	A	N	G	E	"	,	3	1	4	,	O	R	A	N	G	E	\<CR>	\<LF>
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1

```
OBJECT                          = TABLE
  INTERCHANGE_FORMAT            = ASCII
  ROWS                          = 4
  COLUMNS                       = 3
  ROW_BYTES                     = 21

  OBJECT                        = COLUMN
    NAME                        = FRUIT
    DATA_TYPE                   = CHARACTER
    START_BYTE                  = 2
    BYTES                       = 6
  END_OBJECT                    = COLUMN

  OBJECT                        = COLUMN
    NAME                        = NUMBER
    DATA_TYPE                   = ASCII_INTEGER
    START_BYTE                  = 10
    BYTES                       = 3
  END_OBJECT                    = COLUMN

  OBJECT                        = COLUMN
    NAME                        = COLOR
    DATA_TYPE                   = CHARACTER
    START_BYTE                  = 14
    BYTES                       = 6
  END_OBJECT                    = COLUMN
END_OBJECT                      = TABLE
```

As in the IMAGE object, the INTERCHANGE_FORMAT provides the internal format of the data, in this case ASCII. The ROWS and COLUMNS keywords provide the number of rows and columns. The columns are delimited by commas, and the rows by the carriage return (ASCII 13) and line feed (ASCII 10) characters. The ROW_BYTES keywords provides the total number of bytes used to store each row of table data, including the column delimiters and line termination characters.

Within the TABLE object is a second object, the COLUMN object. These objects describe the format of the individual fields in the table. The NAME keyword is used to distinguish one column object from another. The DATA_TYPE keyword provides the format of the data within that field. The START_BYTE keyword provides the starting byte, within each row, of the data part of the field. Note that this does not include field delimiters or quotation marks used to enclose character values. (For example, the "FRUIT" column in the above example starts in the second, not the first byte position. Finally, the BYTES keyword indicates the length of the field in bytes, again excluding delimiters and quotation marks.

Additional keywords may be used in both of these objects to provide supplementary information.

All PDS labels contain a carriage return character (ASCII 13) and a line feed character (ASCII 10) as the line termination characters. This allows the files to be read by the HFS, DOS, Unix, and VMS operating systems.

3.1.2.6   Data Files

The detailed specifications for the formats of the image files are described in a Software Interface Specification published by MIPS (reference 5) and in the DATASET.CAT file, both of which are included on the CDs. All of the image files with the exception of the summation files are uncompressed 16-bit PDS formatted files with detached PDS labels. The summation files may be 32-bit PDS formatted files.

3.2   Content

The following paragraphs describe the content of the CD-ROMs.

3.2.1   Volume Set

The MPL Science Archive volume set is numbered MPLS_0001 through MPLS_000x. Each CD in the set will contain the same directory structure, with the exception of the data subdirectories, which will vary from one CD to another, as they are named on the basis of spacecraft clock count (ie., time).

3.2.2   Directories

The CD-ROM directory structure consists of one ROOT directory, a CALIB subdirectory, a CATALOG subdirectory, a DATA subdirectory, a DOCUMENT subdirectory, an EXTRAS subdirectory, a GAZETTER subdirectory, a GEOMETRY subdirectory, an INDEX subdirectory, a LABEL subdirectory, and a SOFTWARE subdirectory. The DATA subdirectory is further subdivided on the basis of instrument. Figure 3.2.2 gives an overview of the CD structure.

The root directory contains files describing the content and format of the CD-ROMs. The calibration subdirectory contains information about the calibration of the data. The catalog subdirectory contains the completed catalog object templates describing the mission, instruments, etc. The document directory contains duplicates of the files in the catalog directory, formatted for easier reading by humans. It also contains additional, supplemental documentation that will help in understanding the data sets. The gazetteer directory includes a gazetteer of the informal names of the rocks and other features at the MPL landing site, in tabular format. The geometry directory contains SPICE files relevant to the understanding of the data. Files in the index directory include tables of values describing the observation of each data product.   The label directory contains PDS label "include" files. The software directory contains display and processing software useful in the interpretation of the science data. Files in each of the data subdirectories consist of data files with associated attached or detached PDS labels, organized in subdirectories by instrument. Some of these instrument subdirectories may be further

subdivided as described in detail below. The extras subdirectory contains "browse" versions of the data files, formatted for quick display and browsing of the data. It also contains an HTML based interface for "re-playing" the mission.

The following tables describe the content and source of files in the CD-ROM directories. (Source indicates the group providing the current version of a file.)

3.2.2.1   Root Directory

The following table lists the files in the root directory. The ERRATA.TXT file may not be present on all CDs, as it will document errors discovered on previous CDs in the set.

Table 3.2.2.1   Root Directory Contents

File	Contents	Source
AAREADME.HTM, LBL, TXT	Textual information describing the CD-ROM content and format.	All
ERRATA.HTM, LBL, TXT	Textual information describing errors and/or anomalies found on the current or previous CDs.	All
VOLDESC.CAT	A description of the contents of this CD-ROM volume in a human and machine readable format.	All

3.2.2.2   Calibration Subdirectory

This directory contains calibration files necessary to calibrate the data on the CD volumes. Included with this is textual information describing the calibration process and how the calibration files were derived. The following table lists the files in the calibration subdirectory. Please note that only those files which are available at the time the data is ready for CD mastering will be included. No guarantee is made that this directory will even be present on the CD volumes.

Table 3.2.2.2   Calibration Directory Contents

File	Contents	Source
CALINFO.TXT	A textual description of the contents of the CALIB subdirectory.	All
	calibration data and/or files	All

3.2.2.3   Catalog Subdirectory

The files in this directory contain textual information about many aspects of the mission and data, and are written in a format that may be loaded into the PDS Central Node's Data Set Catalog. The following table lists the files in the catalog subdirectory.
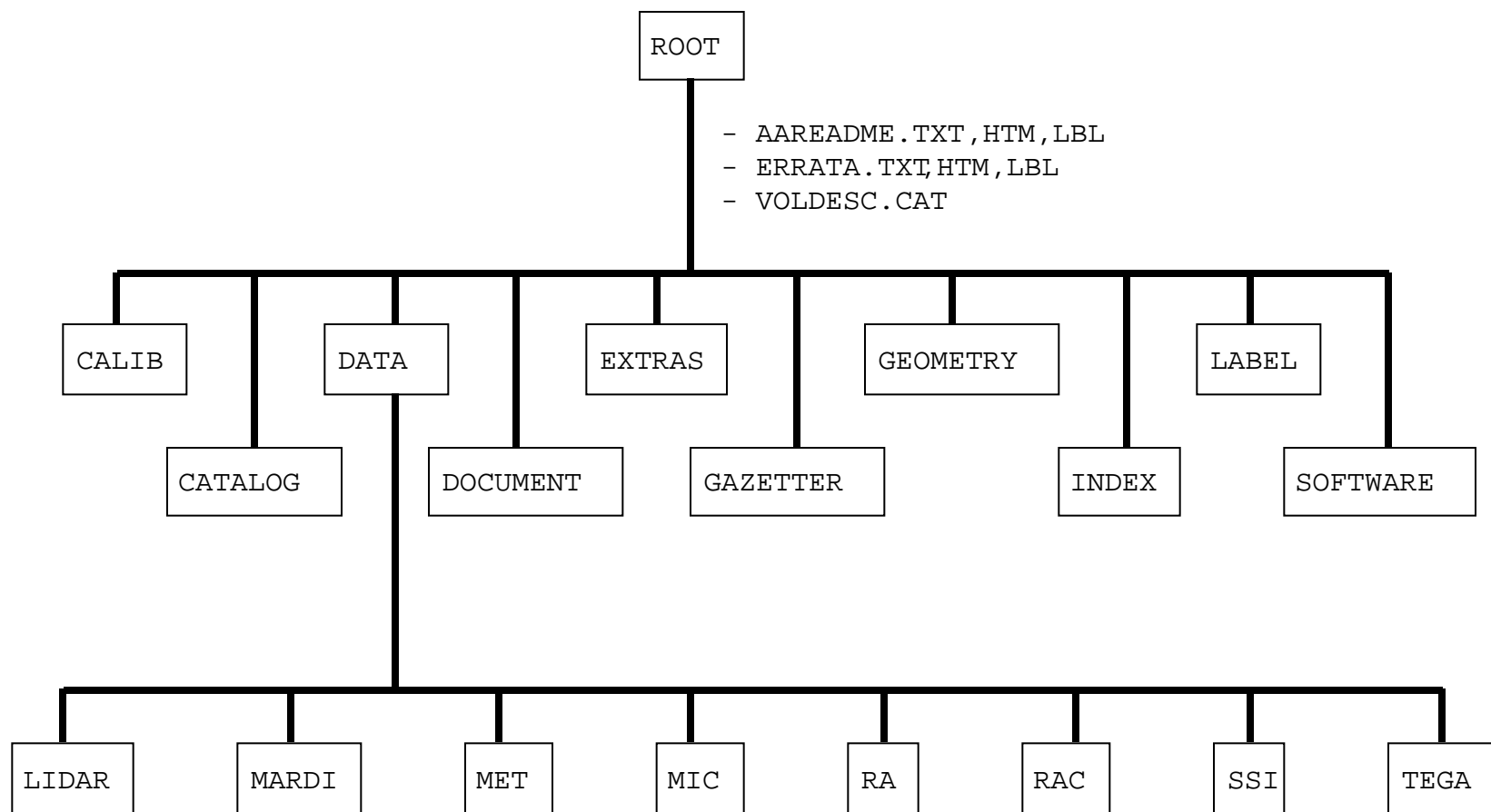
Figure 3.2.2 - High level directory structure of the Mars Polar Lander integrated archive CD.

Table 3.2.2.3 Catalog Directory Contents

File	Contents	Source
CATINFO.TXT	A textual description of the contents of the CATALOG subdirectory.	All
MISSION.CAT	A detailed description of the Mars Surveyor 98 mission.	M98 Project
INSTHOST.CAT	A textual description providing an overview of the Mars Polar Lander.	M98 Project
LIDRINST.CAT	Instrument catalog object for the Light Detection and Ranging instrument. This is a detailed textual description of the instrument including scientific objectives, calibration information, operational considerations, a description of the detectors and electronics (and filters and optics, if appropriate), the operational modes, subsystems, and measured parameters.	LIDAR Team
MARDINST.CAT	Instrument catalog object for the Mars Descent Imager.	MSSS
MET_INST.CAT	Instrument catalog object for the Meteorology package.	MVACS Team
MIC_INST.CAT	Instrument catalog object for the Mars Microphone.	Planetary Society
RA_INST.CAT	Instrument catalog object for the Robotic Arm detectors and sensors.	MVACS Team
RAC_INST.CAT	Instrument catalog object for the Robotic Arm Camera.	MVACS Team
SSI_INST.CAT	Instrument catalog object for the Stereo Surface Imager.	MVACS Team
TEGAINST.CAT	Instrument catalog object for the Thermal and Evolved Gas Analyzer.	MVACS Team
LDREDRDS.CAT	Data set catalog object for the LIDAR EDR (raw) data. This is a detailed textual description including an overview of the data and descriptions of the primary measured parameters, the processing history, the data format, ancillary information necessary to understand the data, any applicable coordinate systems, software necessary for the use of the data, and an analysis of the quality and limitations of the data.	LIDAR Team
LDRRDRDS.CAT	Data set catalog object for the LIDAR RDR (reduced) data.	LIDAR Team
MRDEDRDS.CAT	Data set catalog object for the MARDI EDR (raw) data.	MSSS
METEDRDS.CAT	Data set catalog object for the MET EDR data.	MVACS Team
METRDRDS.CAT	Data set catalog object for the MET RDR data.	MVACS Team
STPRDRDS.CAT?		
MICRDRDS.CAT?		Planetary Society
RAERDRDS.CAT		MVACS Team
RACEDRDS.CAT	Data set catalog object for the RAC EDR (raw) data set.	MVACS Team
RACRDRDS.CAT	Data set catalog object for the RAC RDR (calibrated) data set.	MVACS Team

SSIEDRDS.CAT	Data set catalog object for the SSI EDR (raw) data set.	MVACS Team
SSIRDRDS.CAT	Data set catalog object for the SSI RDR (calibrated) data set.	MVACS Team
TGAEDRDS.CAT	Data set catalog object for the TEGA EDR data.	MVACS Team
TGARDRDS.CAT		MVACS Team
MARS_TGT.CAT	Target catalog object for Mars. This is a textual file containing detailed physical and dynamic parameters pertaining to Mars.	PDS
DEIMSTGT.CAT	Target catalog object for Deimos.	PDS
PHOBSTGT.CAT	Target catalog object for Phobos.	PDS
PERSON.CAT	Personnel catalog object. Contact information for people responsible for producing the science data and archive volume and its component data sets.	All
REF.CAT	Reference catalog object. This is a complete list of references of papers providing further information about the data sets and instrumentation on this volume.	All

3.2.2.4 Document Subdirectory

This directory contains textual files describing the data sets and instruments, plus any other supplementary information available at the time the CDs are ready to be published.

```
┌──────────────┐
│  DOCUMENT    │
└──────────────┘
        ▮
```

Table 3.2.2.4 Document Directory Contents

File	Contents	Source
DOCINFO.TXT	Textual description of the files included in the document directory.	
CONTACTS.ASC, LBL	Contact information for Mars Polar Lander personnel.	
*DS.HTM, LBL	HTML versions of all the data set catalog objects, and accompanying PDS labels.	
RSEDRSIS.HTM, LBL, PDF	Mars Volatiles and Climate Surveyor Experiment Data Record SIS. This is the data product specification for the RAC and SSI EDRs.	JPL/MIPS
*INST.HTM, LBL	HTML versions of all instrument catalog objects, and accompanying PDS labels.	
INSTHOST.HTM, LBL	A textual description providing an overview of the Mars Polar Lander	
KEYWORDS.HTM, LBL	A listing of the PDS keywords used in this data set and their descriptions.	
MISSION.HTM, LBL	A detailed description of the Mars Surveyor 98 mission.	

REF.HTM, LBL	A list of references of papers providing further information about the data set.	
VOLSIS.HTM, LBL, PDF	MPL Robotic Arm Camera Experiment Data Record Volume Organization SIS	
?	Other documentation necessary for understanding the data set.	

3.2.2.5 Gazetteer Subdirectory

The files in this directory contain textual and tabular information about the named features at the Mars Polar Lander landing site. Please note that this information is provided as a convenience to researchers, and that the names assigned to features here have not been approved by the International Astronomical Union. Also note, that only those files which are available at the time the data is ready for CD mastering will be included. Thus, no guarantee is made that all the described files will be included, or that this directory will even be present on the CD volumes.

Table 3.2.2.5 - **Gazetteer Directory Contents**

File	Contents	Source
GAZINFO.TXT	A textual description of the contents of the GAZETTER subdirectory.	
GAZETTER.TXT	A textual description of the structure and contents of the gazetteer table.	
GAZETTER.LBL	The PDS label describing the structure of the gazetteer table.	
GAZETTER.TAB	A table of the MPL landing site named features, along with some descriptive information.	

3.2.2.6 Geometry Subdirectory

The files in this directory contain textual and tabular information about the named features at the Mars Polar Lander landing site. Please note that this information is provided as a convenience to researchers, and that the names assigned to features here have not been approved by the International Astronomical Union. Also note, that only those files which are available at the time the data is ready for CD mastering will be included. Thus, no guarantee is made that all the described files will be included, or that this directory will even be present on the CD volumes.

Table 3.2.2.6 - **Geometry Directory Contents**

File	Contents	Source
GEOMINFO.TXT	A textual description of the contents of the GEOMETRY subdirectory.	

3.2.2.7 Index Subdirectory

The following table lists the files in the index subdirectory. The "INDEX" tables on each CD-ROM shall only reflect those files contained on that CD-ROM. Separate, cumulative index files ("CUMINDEX") which contain a complete listing of all EDRs on the set, will also be included on the volumes.

Table 3.2.2.7 Index Directory Contents

File	Contents	Source
INDXINFO.TXT	Textual description of the contents of the INDEX directory.	
INDEX.LBL	A PDS formatted label describing the format of the INDEX.TAB file.	
INDEX.TAB	A tabular index of selected label items describing the RAC image files on the CD. This table alone is sufficient for doing simple searches for data on the CDs.	
CUMINDEX.LBL	A PDS formatted label describing the format of the CUMINDEX.TAB file.	
CUMINDEX.TAB	A cumulative tabular index containing the contents of the INDEX.TAB files from all of the IMP EDR CD-ROMs.	
CAM_MOD.LBL	A PDS formatted label describing the format of the CAM_MOD.TAB file.	
CAM_MOD.TAB	A table containing information about the camera models used to calibrate the RAC EDRs.	
COMMAND.LBL	A PDS formatted label describing the format of the COMMAND.TAB file.	
COMMAND.TAB	A table containing information about the commands sent to the RAC camera. Along with the EDRINDEX table, forms a relational database describing most of the available parameters for the images on the CDs.	
EDRINDEX.LBL	A PDS formatted label describing the format of the EDRINDEX.TAB file.	
EDRINDEX.TAB	A detailed tabular index of parameters describing the RAC image files. Along with the COMMAND table, forms a relational database describing most of the available parameters for the images on the CDs.	
GEOMETRY.LBL	A PDS formatted label describing the format of the GEOMETRY.TAB file.	
GEOMETRY.TAB	A table containing geometry information about each image derived from different models. (If multiple geometries are not derived during the mission, this table may be combined with the EDRINDEX table.)	

3.2.2.8 Label Subdirectory

The files in this directory contain textual and tabular information about the named features at the Mars Polar Lander landing site. Please note that this information is provided as a convenience to researchers, and that the names assigned to features here have not been approved by the International Astronomical Union. Also note, that only those files which are available at the time the data is ready for CD mastering will be included. Thus, no guarantee is made that all the described files will be included, or that this directory will even be present on the CD volumes.

Table 3.2.2.8 Label Directory Contents

File	Contents	Source

GAZINFO.TXT	A textual description of the contents of the GAZETTER subdirectory.	
GAZETTER.TXT	A textual description of the structure and contents of the gazetteer table.	
GAZETTER.LBL	The PDS label describing the structure of the gazetteer table.	
GAZETTER.TAB	A table of the MPL landing site named features, along with some descriptive information.	

3.2.2.9 Software Subdirectory

This directory will contain image display software capable of displaying the PDS formatted images on this CD. The inclusion of any software depends both on the availability of the software and on the ability to obtain legal permission to distribute it freely. Thus, no guarantee is made that this directory will be included. It is likely that only one of the following software packages will be included. In any case, only limited platform support is expected.

Table 3.2.2.9   Software Directory Contents

File	Contents	Source
SOFTINFO.TXT	A textual description of the contents of the SOFTWARE subdirectory.	MIPS / PDS-CN
BIN/XVD	Executable VICAR XVD display utility, capable of displaying both VICAR and PDS formatted images. Written in Java.	MIPS
DOC/XVD	Documentation about VICAR XVD software.	MIPS
or		
BIN/RT_DISPLAY	Executable real-time display program, capable of displaying both VICAR and PDS formatted M98 images. Written in Java.	MIPS
DOC/RT_DISPLAY	Documentation about real-time display software.	MIPS
or		
PCWIN/NASAVIEW (various files)	PDS NASAView source, executable, documentation, and sample data for PC Windows 32 platform. Capable of displaying PDS formatted files.	PDS-CN
MAC/NASAVIEW (various files)	PDS NASAView source, executable, documentation, and sample data for Power Macintosh platform. Capable of displaying PDS formatted files.	PDS-CN
SUNOS/NASAVIEW or SUNSOLAR/NASAVIEW (various files)	PDS NASAView source, executable, documentation, and sample data for either the SunOS or the SunSolaris operating system. Capable of displaying PDS formatted files.	PDS-CN

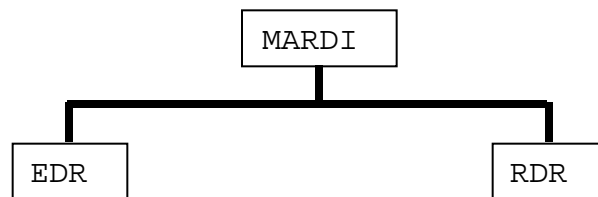### 3.2.2.10 Data Subdirectories

TBD

3.2.2.10.1 LIDAR

TBD

3.2.2.10.2 MARDI

The raw and calibrated images acquired by the Mars Descent Imager will be kept in the MARDI data subdirectory. This directory will contain two subdirectories, EDR and RDR, containing the raw and calibrated data, respectively.

```
            MARDI
          /       \
        EDR        RDR
```

The file naming conventions for the MARDI images are shown in the table below:

3.2.2.10.3 MET

TBD

3.2.2.10.4 MIC

TBD

3.2.2.10.5 RA

TBD

```
RA
```

3.2.2.10.6 RAC

The data subdirectory containing the data acquired by the Robotic Arm Camera is further subdivided into two directories, EDR and RDR, containing the raw and calibrated images, respectively. Each of these directories will then be subdivided by Sol, with each directory containing all of the images acquired on a given Martian day.
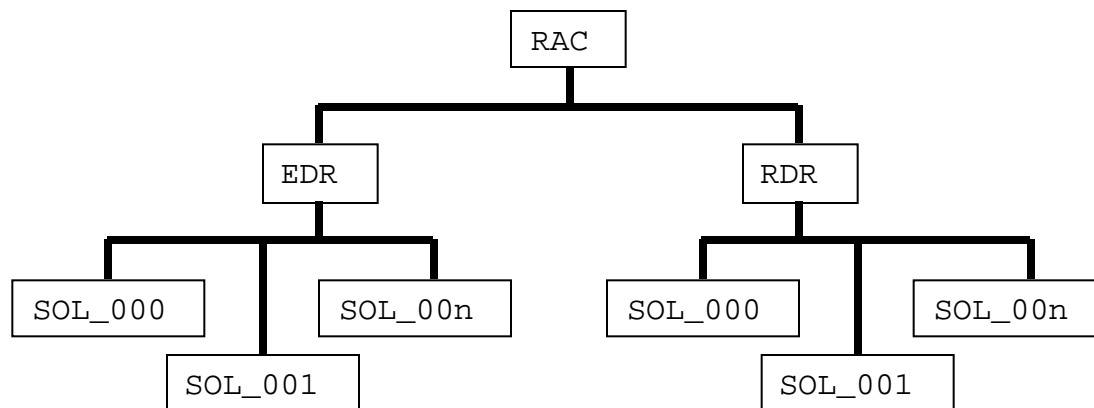
```
                        RAC
                   /          \
                 EDR           RDR
               /  |  \       /  |  \
         SOL_000  |  SOL_00n  SOL_000 | SOL_00n
               SOL_001            SOL_001
```

Figure 3.2.2.10.6 RAC data subdirectory structure.

Within the Sol subdirectories, the image files will be stored as VICAR format files with detached PDS labels. Each VICAR file and its corresponding PDS label will have the same file name, with the exception of the extension, which will be ".IMG" for the former, and ".LBL" for the latter. The specific details of the file naming convention are shown in the tables below.

Table 3.2.2.10.6.A   RAC Data Directory Contents

File	Contents	Source
R<SCLK>_<IMGID>F.IMG (e.g. R0695987653_0055020014L.IMG)	VICAR formatted Experiment/Reduced Data Record. (Complete format descriptions provided in reference 5, RACEDRDS.CAT, and RACRDRDS.CAT.)	JPL/MIPS & MVACS
R<SCLK>_<IMGID>F.LBL (e.g. R0695987653_0055020014L.LBL)	Detached PDS label describing the VICAR image file. (Complete listing of keyword definitions is shown in ref. 5.)	JPL/MIPS & MVACS

The names for the individual images will consist of a single character instrument identifier, a ten-digit spacecraft clock count, an underscore "_", a ten-digit image id, a single character frame identifier, a dot ".", and finally a three character file extension. The filenames will be of the form R<SCLK>_<IMGID>F.EXT, where:

Table 3.2.2.10.6.B   RAC EDR and RDR Filename Components

		Possible Values	Meaning
R	instrument identifier	R	Robotic Arm Camera
SCLK	clock count	(any ten digit integer)	ten digits of Spacecraft Clock Start count
IMGID	image id	(any ten digit integer)	ten digits of Image ID
F	frame identifier	M	monocular image
		N	null strip
		P	post strip
		S	dark strip
EXT	file extension	IMG	VICAR formatted image
		LBL	PDS detached label

The image filenames should be unique within this data set; however, it is always best to use the product id when looking for a unique image identifier.

3.2.2.10.7 SSI

The data subdirectory containing the data acquired by the Surface Stereo Imager is further subdivided into two directories, EDR and RDR, containing the raw and calibrated images, respectively. Each of these directories will then be subdivided by Sol, with each directory containing all of the images acquired on a given Martian day.
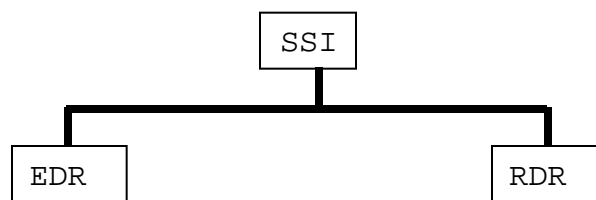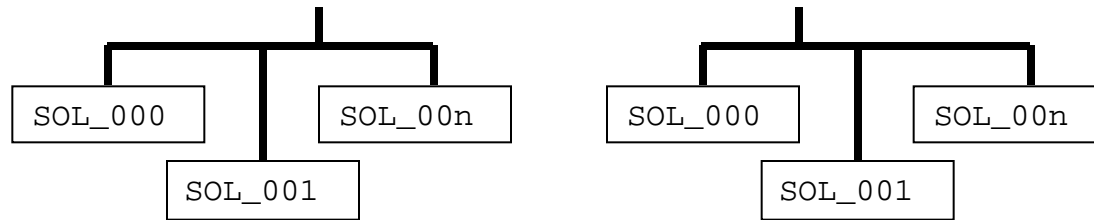
Figure 3.2.2.10.7 SSI data subdirectory structure.

Within the Sol subdirectories, the image files will be stored as VICAR format files with detached PDS labels. Each VICAR file and its corresponding PDS label will have the same file name, with the exception of the extension, which will be ".IMG" for the former, and ".LBL" for the latter. The specific details of the file naming convention are shown in the tables below.

Table 3.2.2.10.7.A   SSI Data Directory Contents

File	Contents	Source
S<SCLK>_<IMGID>F.IMG (e.g. S0695987653_0055020014L.IMG)	VICAR formatted Experiment/Reduced Data Record. (Complete format descriptions provided in reference 5, SSIEDRDS.CAT, and SSIRDRDS.CAT.)	JPL/MIPS & MVACS
S<SCLK>_<IMGID>F.LBL (e.g. S0695987653_0055020014L.LBL)	Detached PDS label describing the VICAR image file. (Complete listing of keyword definitions is shown in ref. 5.)	JPL/MIPS & MVACS

The names for the individual images will consist of a single character instrument identifier, a ten-digit spacecraft clock count, an underscore "_", a ten-digit image id, a single character frame identifier, a dot ".", and finally a three character file extension. The filenames will be of the form S<SCLK>_<IMGID>F.EXT, where:

Table 3.2.2.10.7.B   SSI EDR and RDR Filename Components

		Possible Values	Meaning
S	instrument identifier	S	Surface Stereo Imager
SCLK	clock count	(any ten digit integer)	ten digits of Spacecraft Clock Start count
IMGID	image id	(any ten digit integer)	ten digits of Image ID
F	frame identifier	L	left image
		N	null strip
		P	post strip
		R	right image
		S	dark strip
EXT	file extension	IMG	VICAR formatted image
		LBL	PDS detached label

The image filenames should be unique within this data set; however, it is always best to use the product id when looking for a unique image identifier.

3.2.2.10.8 TEGA

TBD

3.2.2.11 Extras Subdirectory

The browse directory contains HTML, GIF, and JPEG files designed to allow for the easy perusal of the data on the CD. This HTML "browser" begins at the top level with the INDEX.HTM file in the BROWSE directory. Beneath this, the browse directory contains a directory structure identical to that of the data subdirectories. Each of these browse subdirectories contains JPEG-formatted thumbnail-sized and GIF-formatted full-sized versions of the images in the equivalent data directory. They also contain HTML files describing both the individual images, and whole directories. The GIF and JPEG files, and the HTML files describing individual images, all have identical names to the images they describe, except that the file extensions have been changed to ".GIF", ".JPG", and ".HTM" respectively. PDS labels with ".LBL" extensions are also present, describing the other files in each directory.

Table 3.2.2.10   Extras Directory Contents

File	Contents	Source
XTRAINFO.TXT	A textual description of the contents of the Extras subdirectory.	